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A new millipede genus and a new species of *Asphalidesmus* Silvestri, 1910 (Diplopoda, Polydesmida, Dalodesmidea) from southern Tasmania, Australia

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Abstract

Noteremus summus **gen. n.**, **sp. n.** occurs at 1100-1300 m on the summit of Mt Weld, southern Tasmania, while its congener *N. infimus* **sp. n.** is troglobitic in caves in the Junee-Florentine karst, 30-40 km to the northwest. Like species of *Paredrodesmus* Mesibov, 2003 and *Procophorella* Mesibov, 2003, *Noteremus* spp. have a head + 19 rings, no sphaerotrichomes and pore formula 5, 7-18, and are not assigned to family within the suborder Dalodesmidea. *Asphalidesmus golovatchi* **sp. n.** occurs in caves and in forest litter in far southern Tasmania, and the adults have paramedian and median tergal projections. *Asphalidesmus* Silvestri, 1910 is removed from Polydesmidea, Haplodesmidae and placed in Dalodesmidea without family assignment.

Keywords

Diplopoda, Polydesmida, Dalodesmidea, Australia, Tasmania, caves, troglomorphic

Introduction

Tasmania has a rich and entirely endemic fauna of dalodesmidean millipedes, i.e. members of order Polydesmida, suborder Dalodesmidea. Sixty species have so far been named (Mesibov 2009) and at least 50 more are in collections awaiting description. In this paper I describe three new species from Tasmania's south, a mountainous district

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which has not yet been carefully surveyed for rare and geographically restricted invertebrates. Two of the species, a troglomorphic cave-dweller and a non-troglomorphic surface-dweller, are placed in a new genus. The new cave-dweller is the third troglobitic millipede known from Tasmania. The other known troglobites, *Atalopharetra clarkei* Mesibov, 2005 and *A. eberhardi* Mesibov, 2005, are likewise in a southern Tasmanian genus with surface-dwelling congeners (Mesibov 2005). The third species described here occurs both in caves and in forests and is placed in *Asphalidesmus* Silvestri, 1910.

Methods

"Male" and "female" in the text refer to stadium VII individuals unless otherwise indicated. All specimens are stored in 80% ethanol in the Queen Victoria Museum and Art Gallery, Launceston, Tasmania, Australia (QVM). Gonopods were cleared and temporarily mounted in 60% lactic acid for optical microscopy; other body parts were temporarily mounted in a 1:1 glycerine-water mixture. Preliminary drawings on graph paper were made using an eyepiece grid at 64X or 160X. SEM images were acquired digitally using an FEI Quanta 600 operated in high-vacuum mode; alcohol-preserved body parts were air-dried before sputter-coating with gold.

Where given, geographic coordinates (latitude, longitude) are based on the WGS84 datum. Cave locations are treated specially. Of the ca 4000 known caves in Tasmania, fewer than 200 are listed in the official Tasmanian Government gazetteer of named places. The locations of other caves are kept secret by caving enthusiasts. Cave locations are only revealed to members of recreational caving clubs and to a small number of Tasmanian Government employees. Both the clubs and the Government actively discourage publication of exact cave locations. For this reason I provide here only approximate geographic coordinates for cave locations, with an uncertainty of ±1 km.

Results

Order Polydesmida Pocock, 1887
Suborder Dalodesmidea Hoffman, 1980

Genus *Noteremus* Mesibov, gen. n.
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Type species: *Noteremus summus* Mesibov, sp. n., by present designation.
Other assigned species: *N. infimus* Mesibov, sp. n.

Diagnosis. Small to medium-sized dalodesmideans (to ca 20 mm long) with head + 19 rings (H+19); no sphaerotrichomes; pore formula 5, 7-18; slender, straight, unbranched telopodites with two terminal groups of closely packed, pointed, rod-like structures; and spinnerets with ventral setae at least twice as far apart as dorsal setae.

Readily distinguished from *Paredrodesmus* by the presence of paranota as large lateral swellings on posterior segments, and from *Procophorella* by the absence of a narrow, well-defined, upwardly concave groove on the paranotal margin.

Etymology. Greek *notos* ('south') + *eremos* ('solitary'), for the isolated southern distribution of the genus; gender masculine.

Remarks. *Noteremus* species are dalodesmidean in that the small, weakly joined gonocoxae are completely withdrawn into the aperture. However, the absence of sphaerotrichomes sets the genus apart from Dalodesmidae s. str. I therefore place *Noteremus* in the suborder Dalodesmidea without assigning it to a family. I did the same (Mesibov 2003) with the Tasmanian H+19 genera *Paredrodesmus* Mesibov, 2003 and *Procophorella* Mesibov, 2003, which like *Noteremus* have the unusual pore formula 5, 7-18. There are other similarities. In all species of all three genera, the ventral pair of spinneret setae is further apart than the dorsal pair (Figs 4A-4D; type species of *Paredrodesmus* and *Procophorella* illustrated as examples). In *Noteremus*, *Procophorella* and four of the six described *Paredrodesmus* species the solenomere is a short, acuminate process near the telopodite apex, and in *Noteremus* and five *Paredrodesmus* species the telopodite bears clusters of stout, pointed, rod-like structures. It thus seems likely that *Noteremus*, *Paredrodesmus* and *Procophorella* constitute a natural group, but I am reluctant to erect for them a new family or subfamily at this time (see discussion below on *Asphalidesmus*).

Clusters of rod-like structures are present on gonopods in the dalodesmid genus *Icosidesmus* Humbert & de Saussure, 1869. Attems (1940) referred to the structures as "starker Stifte", which I translate as stout pegs or pins, while Johns (1964) called them "long, stout setae". Jeekel (2006) examined two New Zealand *Icosidesmus* species and named the structures "bacilli" (rods) and the clusters "bacillaries". A similar cluster on the gonopod of *Tasmaniosoma armatum* Verhoeff, 1936 was called "eine starke Borstengruppe" by Verhoeff (1936), i.e. a stout group of bristles. If these structures are homologous, it is interesting that they can appear in different places on the telopodite, i.e. at mid-height in parallel clusters in *Icosidesmus* and *Tasmaniosoma*, in upright parallel clusters in *Noteremus*, and in sub-apical, sometimes fan-like clusters in several *Paredrodesmus* species.

***Noteremus summus* Mesibov, sp. n.**

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Figs 1A, 2A, 3A, 3B, 4A, 4F, 5A, 5B, 6A, map Fig. 9.

Holotype. Male. Australia, Tasmania, Mt Weld, 43°00'20"S 146°34'44"E ±100m, 1300 m, pitfall WD1300P5L emptied 29 March 2001, N. Doran and R. Bashford, sample FT187, QVM 23:46550.

Paratypes. 1 male, same details as holotype but WD1300P25L, FT188, QVM 23:46551; 2 males, same details but WD1300P25U, 22 January 2002, FT5915, QVM 23:46556; 1 male, same locality, 43°00'24"S 146°35'02"E ±100m, 1200 m,

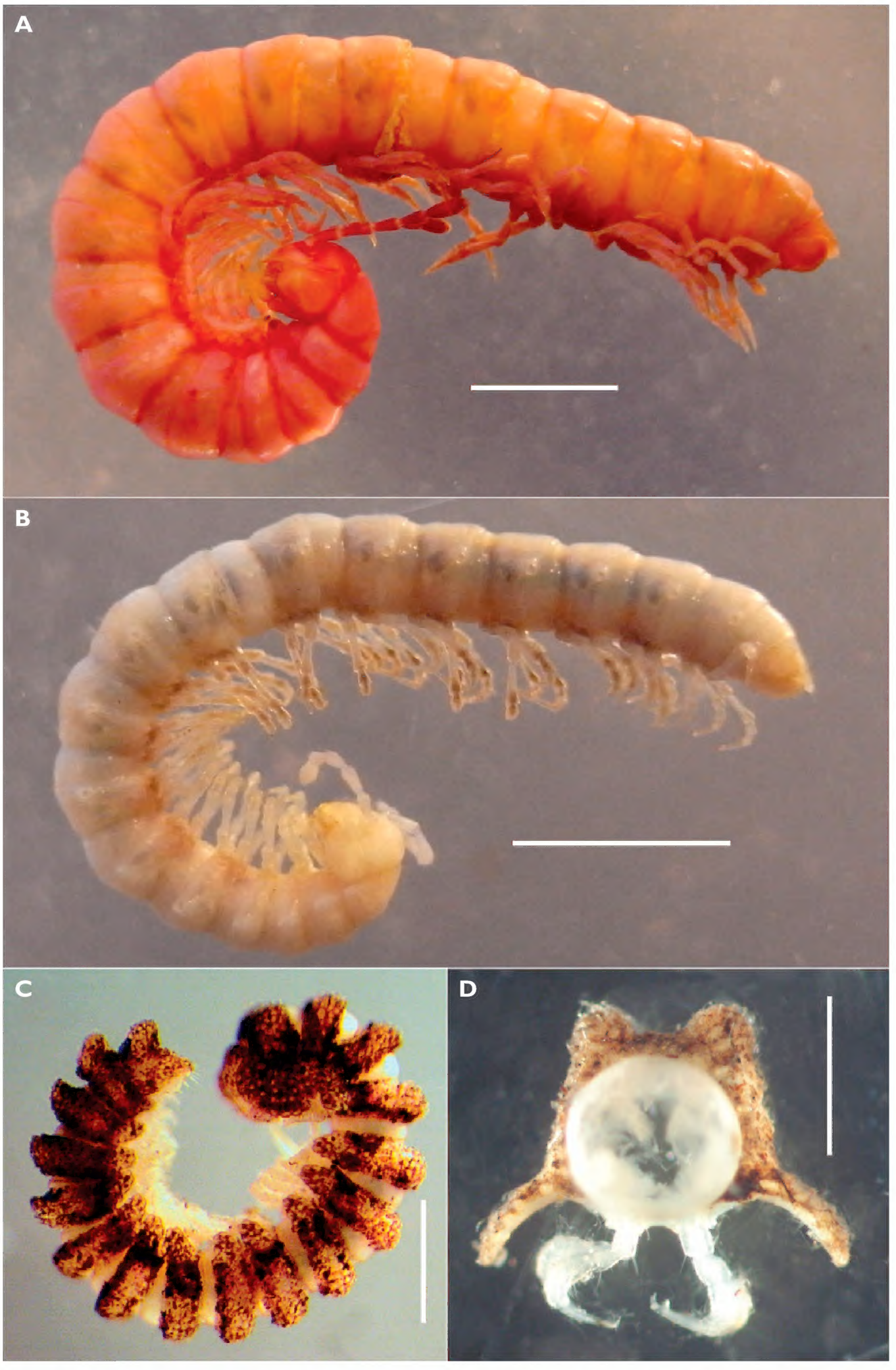

Figure 1. (A) *Noteremus summus* sp. n., paratype female, QVM 23:46549; (B) *N. infimus* sp. n., paratype female, QVM 23:12339. (C), (D) *Asphalidesmus golovatchi* sp. n.: (C) Partly curled paratype male, QVM 23:46402; (D) anterior view of ring 6, paratype male, QVM 23:46560. Scale bars: (A), (B) = 2.5 mm, (C) = 1.0 mm, (D) = 0.5 mm.

WD1200P25U, 22 January 2002, same collectors, FT5909, QVM 23:46555; 1 male, 2 females, same locality, 43°00'21"S 146°35'23"E ±100m, 1100 m, WD-1100P25U, 29 March 2001, same collectors, FT179, QVM 23:46549; 1 male, same details but WD1100P45U, 26 April 2001, FT270, QVM 23:46552; 1 male, same details but WD1100P5U, 18 December 2001, FT5812, QVM 23:46553; 1 male, same details but WD1100P25U, FT5813, QVM 23:45554.

Diagnosis. Medium-sized (to ca 20 mm long), pigmented, surface-dwelling; midbody ring length to prozonite width ca 1.0; gonopod telopodite with two separate subterminal groups of pointed, rod-like structures on posteromedial surface near apex.

Description. Male/female approximate measurements: length 20/22 mm, maximum diameter 1.6/2.2 mm, maximum width across paranota 2.0/2.5 mm. Body colour faded in pitfall liquid and preservative, but better-preserved specimens are light reddish-brown grading to red anteriorly.

Male with head sparsely setose; antennal sockets slightly impressed, separated by ca 1.5X socket diameter. Antenna (Fig. 2A) slender, when manipulated reaching tergite 2; antennomere 6 widest; relative antennomere lengths 6>(2,3)>5>4. Head slightly wider than collum, slightly narrower than tergite 2; overall widths increasing slightly from rings 2 to 5, 6-16 more or less equal, 17 narrower. Ratio of ring length to prozonite width in midbody rings ca 1.0 (Fig. 3A). Collum from above with anterior and lateral margins nearly forming a semicircle, corners blunt, posterior margin with median half straight, lateral quarters obliquely joined to collum corners. Prozonites and metazonites smooth (Figs 3A, 3B); transverse furrow not distinguishable; waist pronounced, suture indistinct; a few very small setae posteriorly on metatergite. Limbus extremely small; tabs irregular in shape, ca 1-2 µm long. Paranota on rings 2-4 small, depressed, rounded anteriorly and posteriorly; ring 2 paranotum lower than collum and ring 3 paranotum; more posterior paranota expanded to rounded

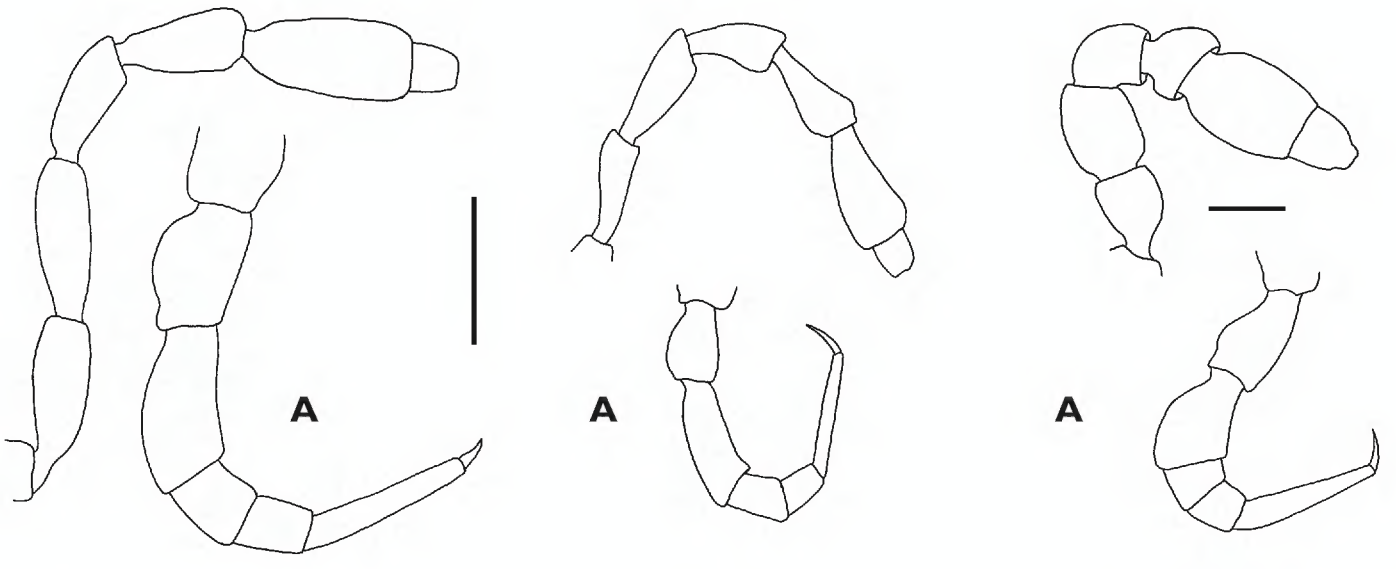

Figure 2. Antenna and leg 6 of paratype males. (A) *Noteremus summus* sp. n., QVM 23:46549; (B) *N. infimus* sp. n., QVM 23:12339; (C) *Asphalidesmus golovatchi* sp. n., QVM 23:46560. Scale bars: (A), (B) = 0.5 mm, (C) = 0.1 mm. Setae and antennal cones not shown.

swellings at ring mid-height, tapering towards posterior corner. Ozopore small and round, opening dorsolaterally at about half ring height, close to posterior paranotal corner; pore formula 5, 7-18. Spiracle small, round, recessed, opening on short, wide-rimmed elevation; anterior spiracle on diplosegments opening just above and anterior to anterior leg base, posterior spiracle above and about midway between leg bases. Sternites longer than wide, very sparsely setose, longitudinal and transverse impressions well-defined. Pre-anal ring with a few setae; epiproct broadly rounded, only slightly extending past anal valves; hypoproct trapezoidal. Ventral spinnerets ca 2.5X further apart than dorsal spinnerets (Fig. 4A); spinneret seta set in thin, closely fitting sheath with irregular margin. Anterior legs (Fig. 2A) a little swollen with prefemur and femur somewhat expanded dorsally, tarsus straight, claw small; relative podomere lengths tarsus>femur>prefemur>(postfemur, tibia). No sphaerotrichomes; brush setae on prefemur, femur, postfemur, tibia; brush setae unbranched with tapered tips. Gonopore small, round, on distomedial projection of leg 2 coxa. Bases of legpairs 5, 6, 7 separated to accommodate retracted gonopods, legpair 5 bases less so; small, paired,

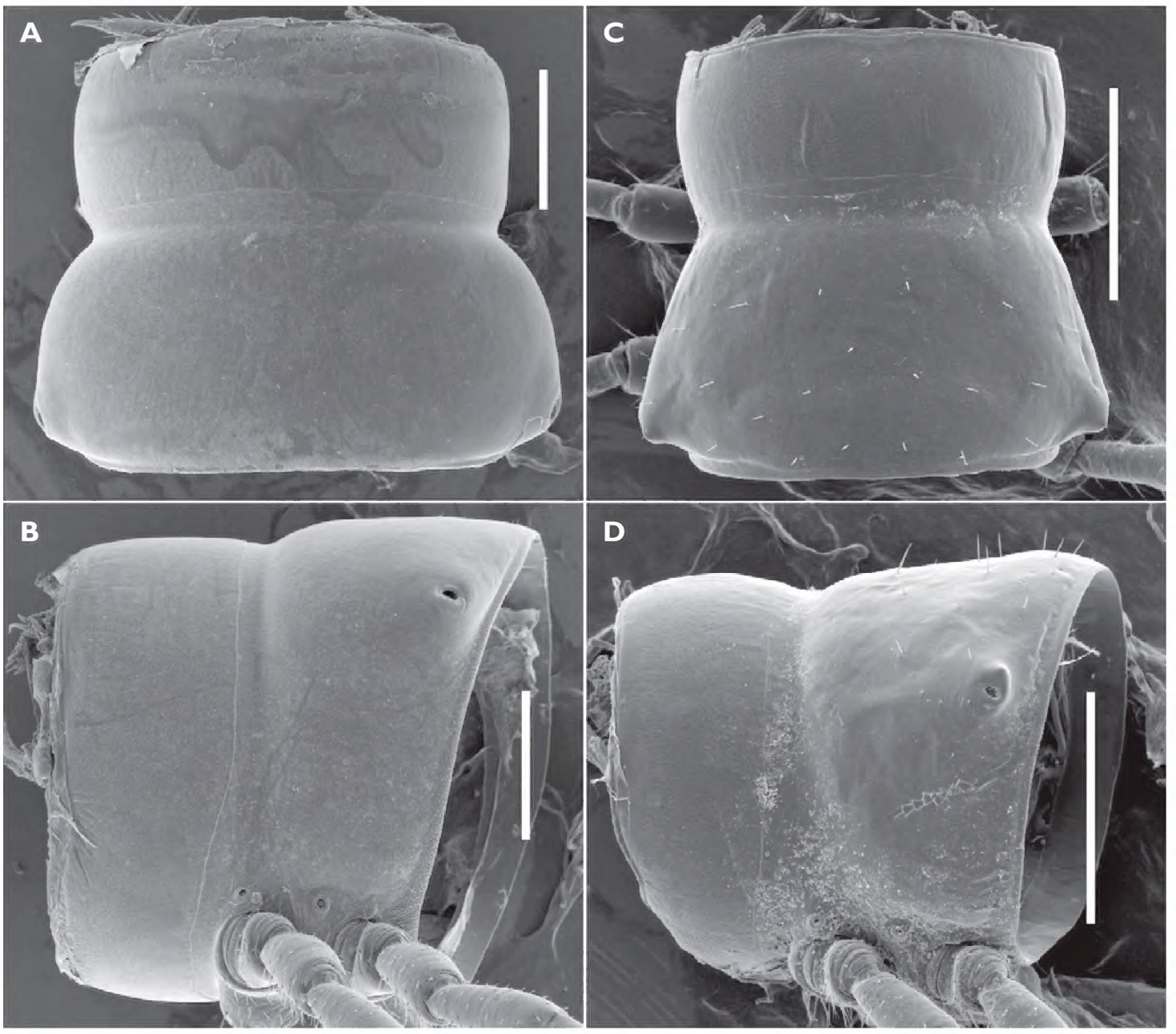

Figure 3. Dorsal view of ring 12 and left lateral view of ring 13 of paratype males. (A), (B) *Noteremus summus* sp. n., QVM 23:46556; (C), (D) *N. infimus* sp. n., QVM 23:12969. Scale bars = 0.5 mm.

conical projections on sternal portion of legpair 4 bases, each projection tipped with small brush of setae (Fig. 4F).

Gonopod aperture about one-third prozonite width, rhomboid with long anterior edge close to anterior prozonite margin; posterior rim of aperture slightly raised. Gonocoxae small, short, tapering distally, concave mediobasally, weakly joined mediodistally. Cannula prominent, inserting in shallow depression on basal surface. Telopodites separate, reaching to legpair 4 bases when retracted. Telopodite (Figs 5A, 5B, 6A) thin, straight, unbranched, with flared base and equally expanded apex. Solenomere a short, acuminate process on medial side of telopodite apex. Prostatic groove bending anteriorly in flared telopodite base, then posterodistally and running more or less directly

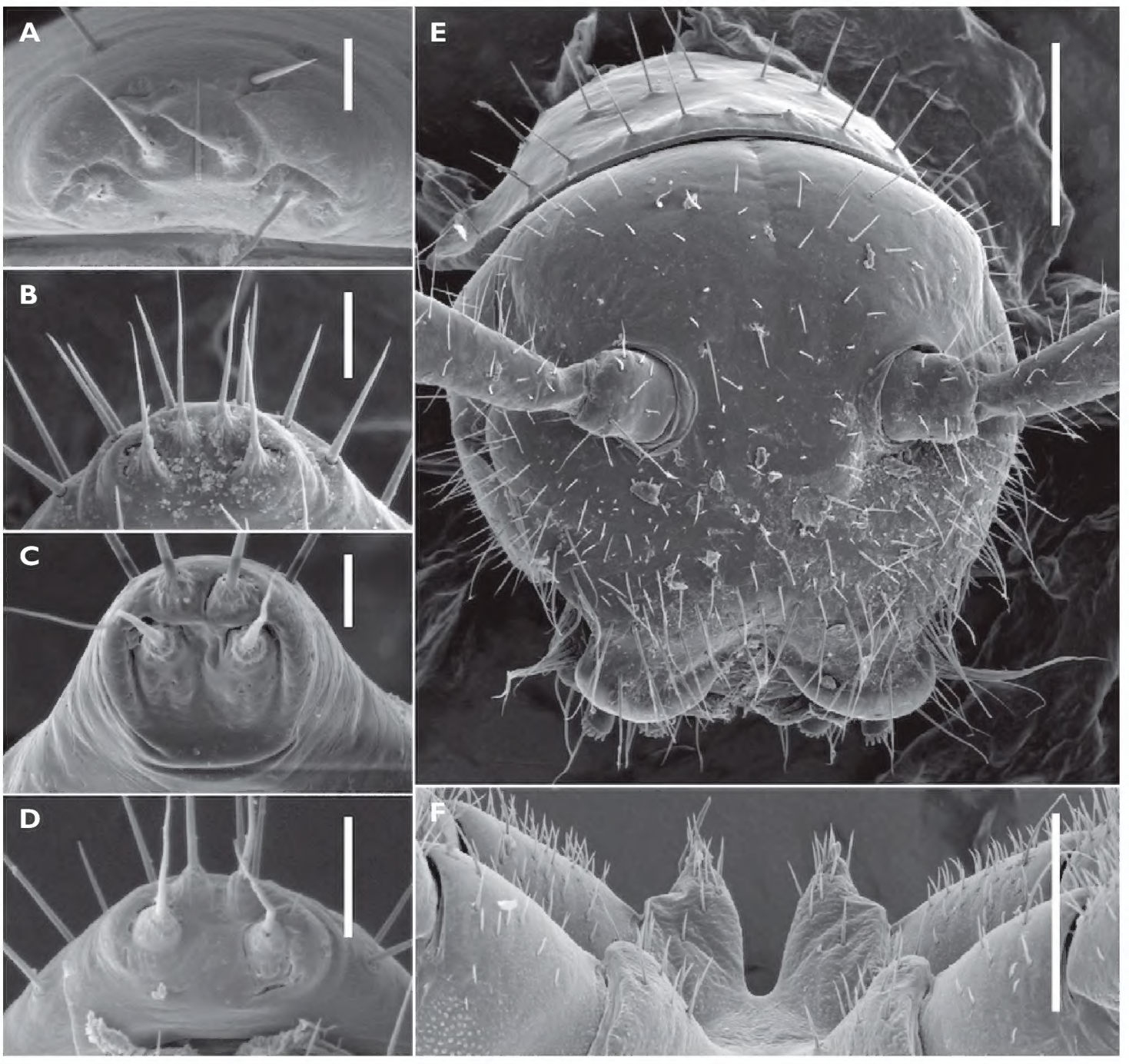

Figure 4. (A)-(D) Spinnerets, posterior view. (A) *Noteremus summus* sp. n., paratype male, QVM 23:46556; (B) *N. infimus* sp. n., paratype male, QVM 23:12969; (C) *Paredrodesmus taurulus*, male, QVM 23:46313; (D) *Procophorella innupta*, male, QVM 23:25456. (E) *N. infimus* sp. n., head of male from Growling Swallet cave, QVM 23:12118. (F) *N. summus* sp. n., paratype male, QVM 23:46556, posterior view of ring 5 showing legpair 5 bases (foreground) and legpair 4 bases (background). Scale bars: (A)-(D) = 0.05 mm; (E), (F) = 0.25 mm.

to solenomere on medial side of telopodite. Telopodite with numerous short, very fine setae at base near cannula insertion; a few longer setae on posterolateral surface close to base; and two closely packed groups of pointed, rod-like structures at or near the apex: a distal row extending distolaterally to a small cluster, and two separate posteromedial clusters at either end of a short, low posteriormedial ridge near the telopodite apex.

Female (Fig. 1A) larger than male, anterior legs not swollen; posterior margin of epigynum produced medially as narrow, round-tipped projection, just reaching beyond leg 2 coxae ventrally; cyphopods not examined.

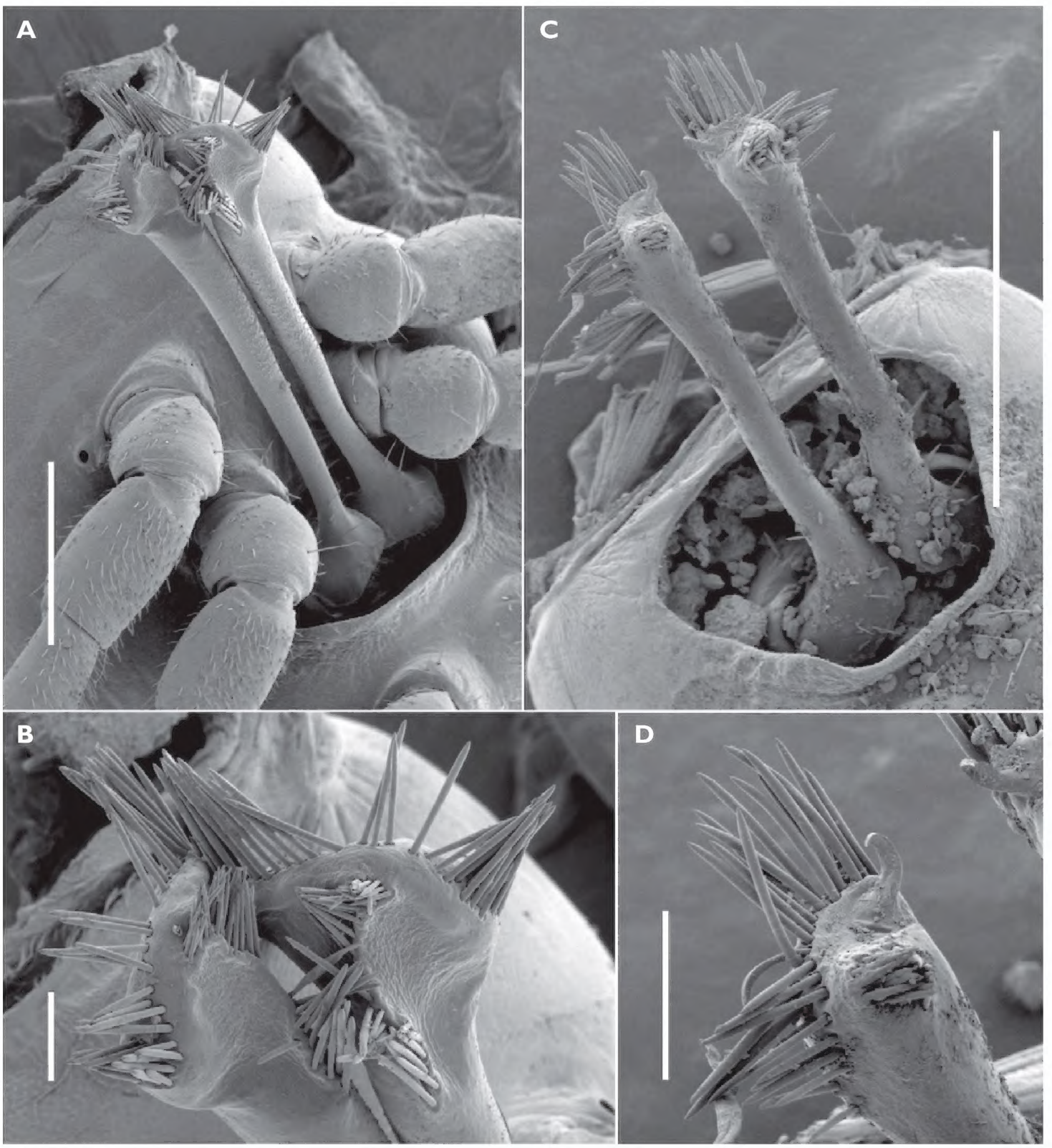

Figure 5. Gonopods of paratype males in situ; lower images are enlargements of upper images. (A), (B) *Noteremus summus* sp. n., QVM 23:46556; (C), (D) *N. infimus* sp. n., QVM 23:12969. Scale bars: (A), (C) = 0.5 mm; (B), (D) = 0.1 mm.

Distribution and habitat. So far known only from grassland, scrub and subalpine woodland on the summit of Mt Weld, southeast Tasmania, from 1100 to 1300 m elevation (Fig. 9).

Etymology. Latin *summus* ('highest'), adjective, nominative singular, for its occurrence on a mountain summit.

Remarks. *N. summus* is the largest H+19 polydesmidan in Tasmania. The next largest species, an undescribed species of *Tasmaniosoma* Verhoeff, 1936, has a maximum diameter in females of less than 1.5 mm, compared to 2.2 mm in *N. summus*.

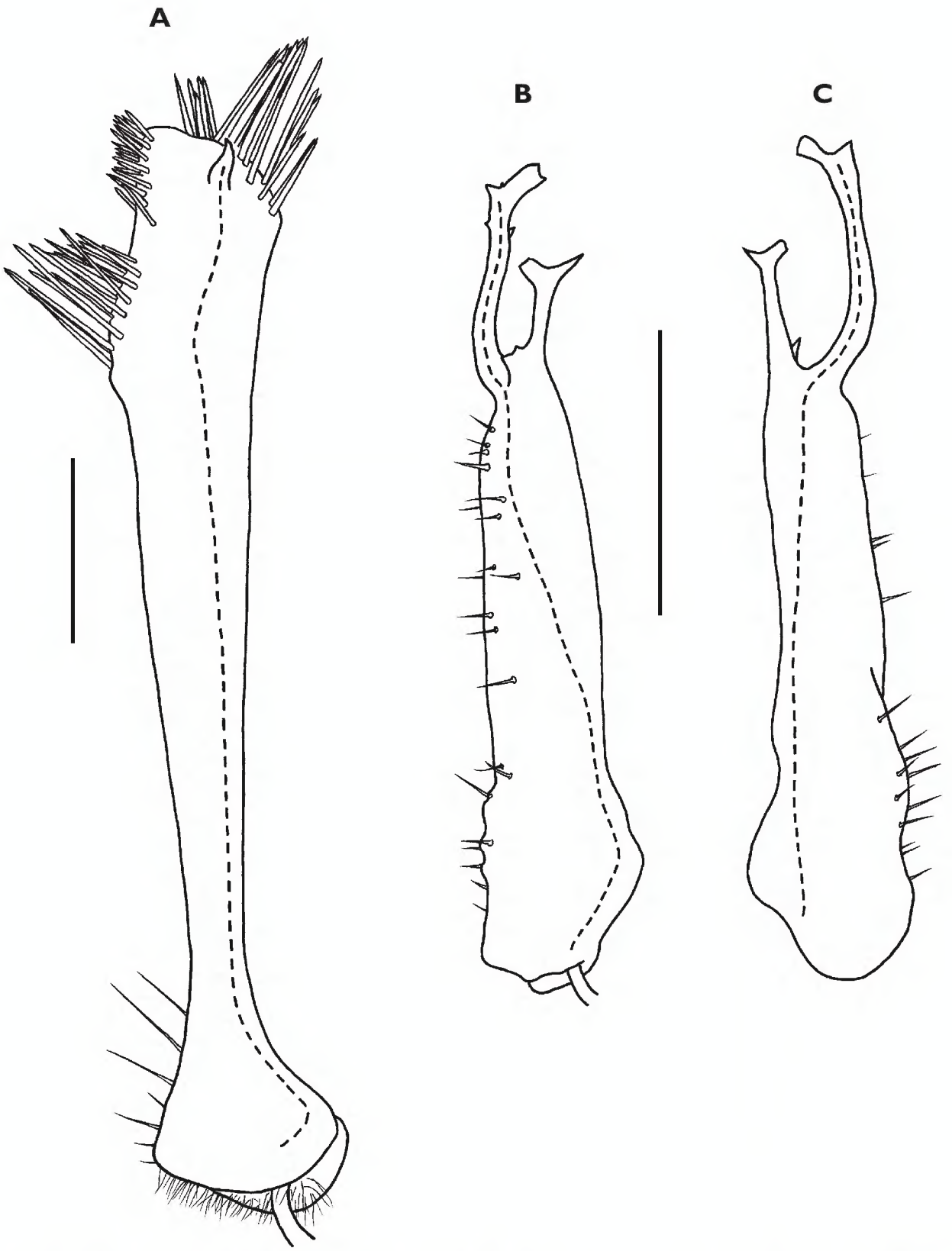

Figure 6. Right gonopod of paratype males. (A) *Noteremus summus* sp. n., QVM 23:46549, medial view. (B), (C) *Asphalidesmus golovatchi* sp. n., QVM 23:46560; (B) medial and slightly posterior view, (C) anterior view. Scale bars = 0.25 mm. Dashed lines indicate course of prostatic groove.

All specimens are from 2001-2002 invertebrate sampling on the Mt Weld altitudinal transect. The transect was a satellite project of the International Biodiversity Observation Year and was established and sampled by Forestry Tasmania and the Tasmanian Department of Primary Industries and Water. At the 1100, 1200 and 1300 m sites, six weather-protected pitfall traps (ca 400 mL capacity, ca 90 mm top diameter, filled either with undiluted ethylene glycol or the same plus 5% glycerol) were left open for about four weeks every month in the austral summer. Site details and transect history are given in Grove (2004).

At 1100 to 1300 m on Mt Weld, *N. summus* co-occurs with the polydesmidans *Atalopharetra bashfordi* Mesibov, 2005, *A. johnsi* Mesibov, 2005, *Atrophotergum montanum* Mesibov, 2004, *Paredrodesmus bicalcar* Mesibov, 2003 and an undescribed species of *Tasmaniosoma* (specimens in Mt Weld transect samples in QVM).

***Noteremus infimus* Mesibov, sp. n.**
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Figs.1B, 2B, 3C, 3D, 4B, 4E, 5C, 5D, map Fig. 9.

Holotype. Male. Australia, Tasmania, Junee-Florentine karst, Khazad Dum (cave), 42°43'S 146°34'E ±1 km, 25 March 1990, R. Eberhard, field no. JF4, 'silt bank near stream, dark wetway pitches', QVM 23:46557.

Paratypes. 2 males, 2 females, 1 stadium VI female, details as for holotype, QVM 23:12969; 2 males, 5 females, same details but 27 June 1989, S. Eberhard, field no. JF4-29, 'more common in deep, near stream', QVM 23:12339.

Material examined. All collected by S. Eberhard in the Junee-Florentine karst: 2 males, 1 female, Cauldron Pot (cave), 42°43'S 146°35'E ±1 km, 9 July 1989, field no. JF2-2, deep, beyond Au Cheval, QVM 23:12127; 3 females, same details but 15 July 1989, JF2-9, deep, beyond Au Cheval, QVM 23:12116; 1 male, 1 female, 1 stadium VI male, same details but 28 January 1990, JF-2, streamway, QVM 23:12951; 1 female, same details but 2 April 1990, JF-2, deep, QVM 23:12955; 1 female, Growling Swallet (cave), 42°41'S 146°30'E ±1 km, 1984, JF36-18, QVM 23:12107; 1 male, 1 female, same details but 16 February 1985, JF36-25, QVM 23:12095; 1 male, 1 female, same details but 14 April 1985, JF36-27, QVM 23:12105; 1 male, same details but 2 June 1985, JF36-40, New Feeling passage, QVM 23:12118; 1 female, same details but 13 April 1990, JF36, mainstream, QVM 23:13498; 2 males, 1 stadium VI female, Porcupine Pot (cave), 42°40'S 146°30'E ±1 km, 3 November 1985, JF387-1, deep, QVM 23:12156; 5 males, 1 female, same details but 10 November 1985, JF387-2, deep, QVM 23:12134; 2 males, Niggly Cave, 42°42'S 146°31'E ±1 km, 28 April 1990, JF237-2, QVM 23:12094; 1 female, same details but JF237, cracks, QVM 23:13272; 1 female, Rift Cave, 42°43'S 146°35'E ±1 km, 4 January 1985, JF34-4, QVM 23:12163; 2 males, 2 females, same details but 12 June 1988, JF34-7, near intermittent stream, deep (-150m), QVM 23:12161; 1 stadium VI male, Burning

Down the House (cave), 42°39'S 146°29'E ±1 km, 11 September 1988, JF402-2, 'common through cave', QVM 23:12181; 2 males, 2 females, Gormenghast (cave), 42°41'S 146°30'E ±1 km, 19 November 1989, JF35-3, deep, QVM 23:12336; 1 male, 5 females, Junee Cave, 42°44'S 146°36'E ±1 km, 22 October 1989, JF8-3, 'common beside stream, on rocks and mudbanks', QVM 23:12119; 1 male, 1 female, 2 stadium VI females, Owl Pot (cave), 42°40'S 146°30'E ±1 km, September 1983, JF221-4, 60-200m deep, QVM 23:12121; 2 females, Pendant Pot (cave), 42°41'S 146°30'E ±1 km, April 1984, JF37-6, QVM 23:12335; 1 female, Serendipity (cave), 42°42'S 146°30'E ±1 km, 12 January 1985, JF344-4, QVM 23:12164; 1 female, Tassy Pot (cave), 42°40'S 146°30'E ±1 km, September 1983, JF223-5, deep, -200m, QVM 23:12157; 1 female, 1 stadium VI male, The Chairman (cave), 42°43'S 146°36'E ±1 km, 26 June 1988, JF99-2, deep, 'near perennial or intermittent streams', QVM 23:12111; 1 female, Troll Hole (cave), 42°44'S 146°35'E ±1 km, 7 October 1989, JF-x1-3, deep 'terminal RF Ch, -87m', QVM 23:12162; 1 female, Voltera (cave), 42°43'S 146°32'E ±1 km, 12 November 1989, JF207-1, 'at bottom (-25m) in crack between rock and sediment', QVM 23:12115; 1 stadium IV female, Wherrets Cave, 42°42'S 146°32'E ±1 km, 3 December 1989, JF-x6-4, deep, 'base of aven', QVM 23:12333.

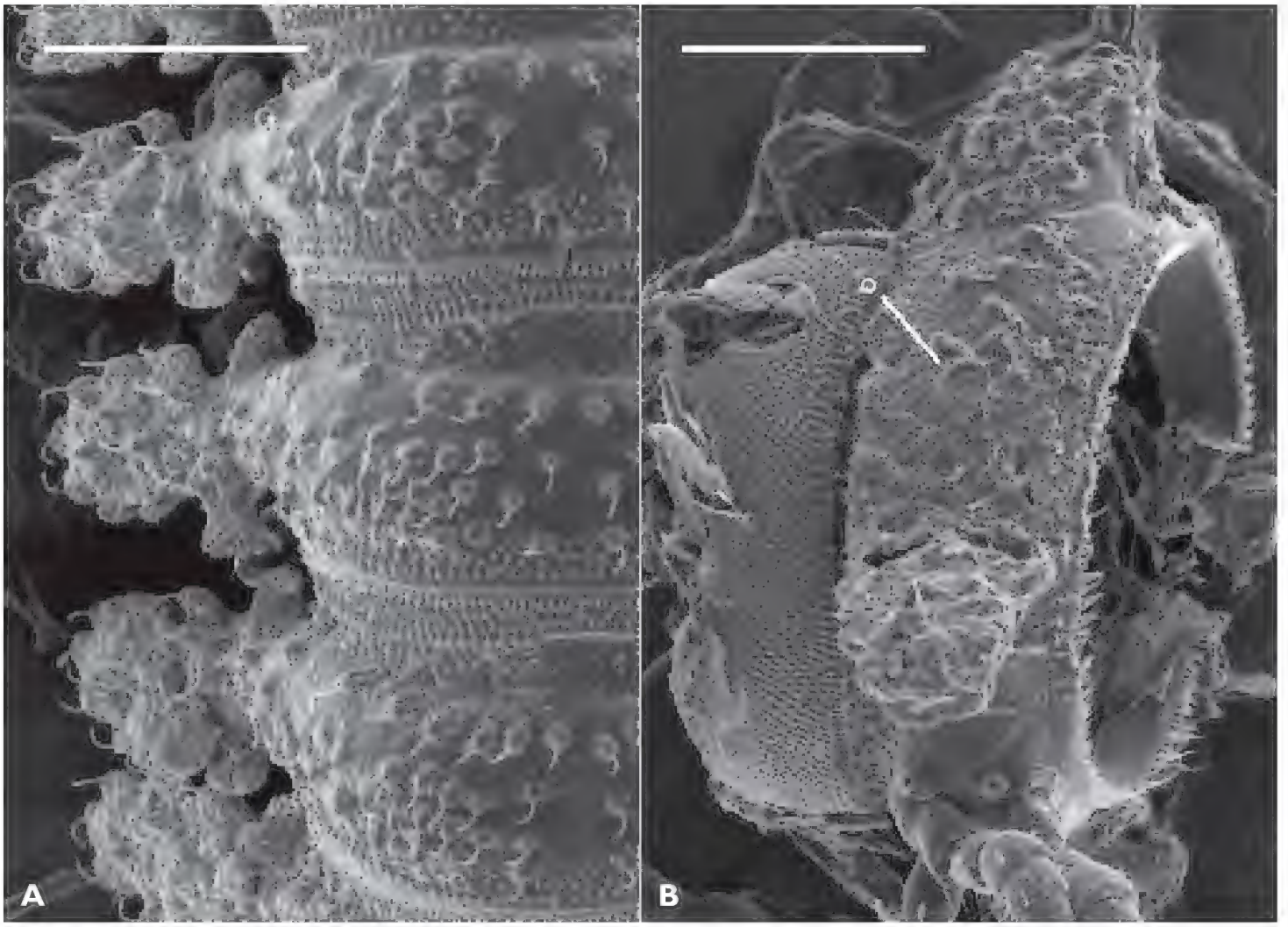

Figure 7. *Asphalidesmus golovatchi* sp. n. (A) Dorsal view of midbody rings, male cave specimen with metatergite projections greatly reduced (compare Fig. 1E), QVM 23:12167; (B) left lateral and slightly ventral view of ring 12, surface-dwelling paratype male, QVM 23:46560. Scale bars = 0.25 mm; **o** = ozopore.

Diagnosis. Small (to ca 12 mm), unpigmented, cavernicolous; midbody ring length to prozonite width 1.1-1.3; gonopod telopodite with one subterminal group of pointed, rod-like structures on posterior surface near apex vs. two groups in *N. summus*.

Description. As for *N. summus*, with differences as follows. Male/female approximate measurements: length 12/13 mm, maximum diameter 0.9/1.1 mm, maximum width across paranota 1.2/1.4 mm. Body unpigmented.

Male with head densely setose (Fig. 4E); antennal sockets moderately impressed, separated by ca 2X socket diameter. Antenna (Fig. 2B) slender; antennomere 6 widest; relative antennomere lengths (6,2,3)>5>4. Overall widths of rings 2-4 about equal, increasing slightly from 5 to 7, 8-16 more or less equal, 17 narrower. Ratio of ring length to prozonite width in midbody rings 1.1-1.3 (Figs 3C, 3D). Three transverse rows of short setae on metatergite. Paranota on rings 2-4 relatively wide, margins with three broad teeth, each bearing a stout seta. Ozopore small, round, opening laterally just ventral to short eminence at about half ring height close to posterior paranotal

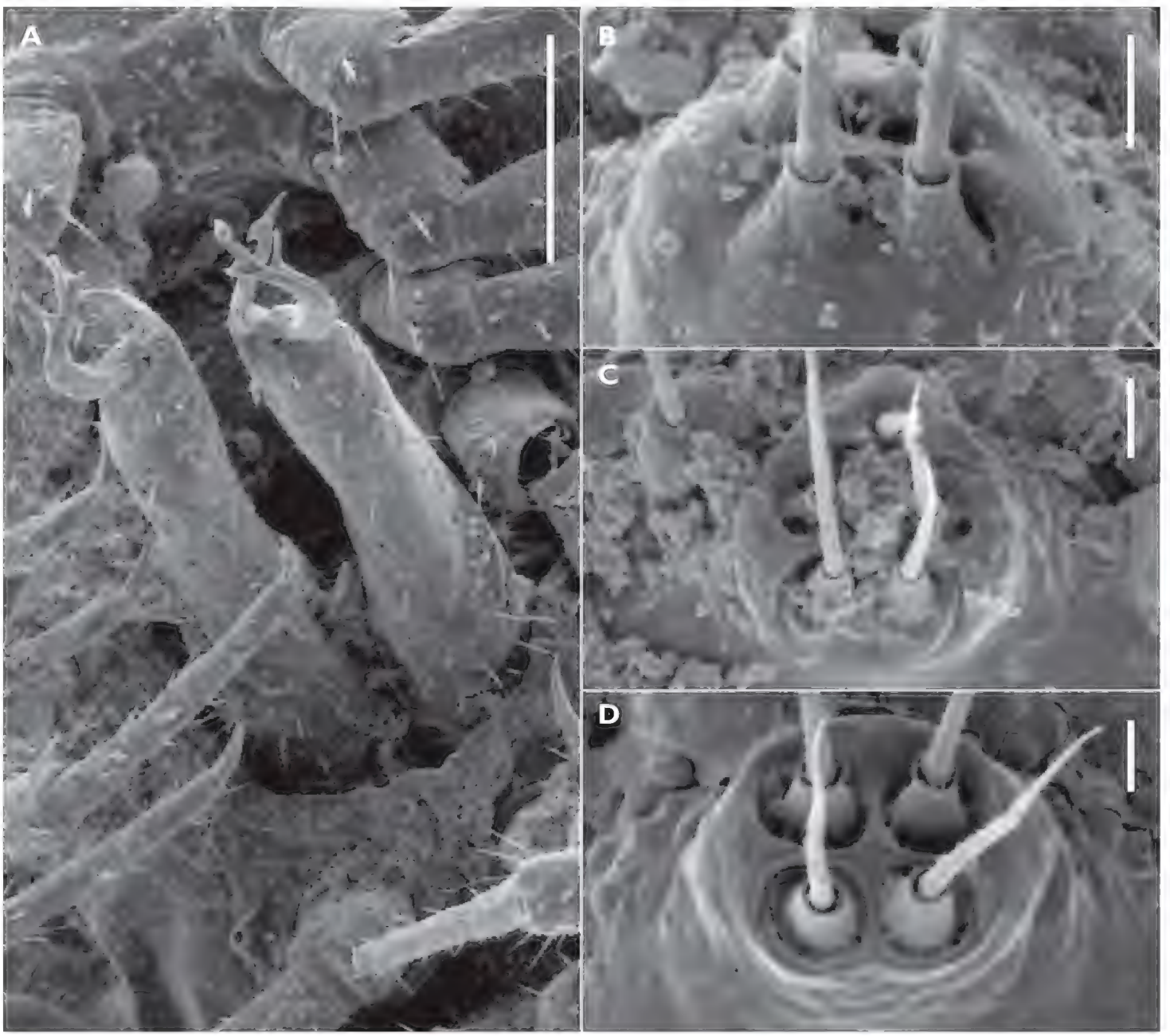

Figure 8. (A) *Asphalidesmus golovatchi* sp. n., QVM 23:12167, gonopods in situ. (B)-(D) Spinnerets of males, posterior view. (B) *A. golovatchi* sp. n., QVM 23:12167, (C) *A. leae*, QVM 23:25091, (D) *A. parvus*, QVM 23:25611. Scale bars: (A) = 0.1 mm, (B)-(D) = 0.01 mm.

corner. Sternites very sparsely setose. Hypoproct broadly convex. Anterior legs (Fig. 2B) not swollen, prefemur slightly expanded dorsally, claw large; relative podomere lengths (tarsus, femur)>prefemur>(postfemur, tibia). Long, tapered setae in place of brush setae on prefemur, femur, postfemur, tibia.

Gonopod telopodite (Figs 5C, 5D) with distal row of pointed, rod-like structures extending to lateral surface of apex, and one small posterior cluster just below apex.

Distribution and habitat. Common in caves in the Junee-Florentine karst northwest of Maydena in south central Tasmania (Fig. 9), to at least 200 m depth.

Etymology. Latin *infimus* ('lowest'), adjective, nominative singular, for its occurrence deep below ground in caves.

Remarks. *N. infimus* is troglomorphic in lacking pigment, and in having more and longer setae, and more slender rings, legs and antennae than its surface-dwelling congener *N. summus*. A troglobitic polydesmidan from the Cape Range in Western Australia, *Stygiochiropus communis* Humphreys & Shear, 1993 (Paradoxosomatidae), has been shown to vary considerably from cave to cave in details of gonopod form (Humphreys and Shear 1993). In contrast, there is almost no gonopod variation from cave to cave in *N. infimus*. However, populations vary across the Junee-Florentine karst in the degree to which the trunk and legs are attenuated. Growling Swallet cave has the most troglomorphic specimens, with midbody ring length ca 1.3 X prozonite width. In both males and females from Growling Swallet the lower edge of the labrum is extended ventrolaterally on either side as a rounded tab of unknown function (Fig. 4E).

N. infimus is the only troglobitic millipede so far known from the Junee-Florentine karst. The surface-dwelling polydesmidans *Paredrodesmus bicalcar*, *Tasmanodesmus hardyi* Chamberlin, 1920 and an undescribed *Tasmaniosoma* species have also been found in Junee-Florentine caves, but only close to the surface (QVM specimen records).

Although the forests of the Florentine Valley have been repeatedly sampled for millipedes, no surface-dwelling *Noteremus* species has so far been found there. The disjunction between *N. infimus* and *N. summus* is 30-40 km.

Asphalidesmus Silvestri, 1910

Asphalidesmus Silvestri 1910:362; Attems 1914:242, 1926:153, 1931:77, 1940:205; Brolemann 1916:547; Verhoeff 1932:1587, 1936:12; Jeekel 1971:313, 1982:12, 1984:85, 1986:46; Hoffman 1980:150; Mesibov 2002:532; Golovatch 2003:53.
Atopodesmus Chamberlin 1920:153; Attems 1926:134, 1940:356; Verhoeff 1932:1562; Jeekel 1971:313, 1984:85, 1986:46; Hoffman 1980:186; Mesibov 2002:532.
Type species: *Asphalidesmus leae* Silvestri, 1910
Other included species: *A. golovatchi*, sp. n., *A. parvus* (Chamberlin, 1920)

Remarks. I reviewed the taxonomic placement of *Asphalidesmus* several years ago (Mesibov 2002) and reported that the genus had been assigned at various times to Dalodesmidae Cook, 1896, Fontariidae Attems, 1926 and Vanhoeffeniidae Attems, 1914

before being placed by Jeekel (1984) in Haplodesmidae Cook, 1895 in the suborder Polydesmidea Pocock, 1887. I was unaware at the time that *Asphalidesmus* had also been listed in Xystodesmidae Cook, 1895 by Attems (1914). *Atopodesmus*, meanwhile, had been variously assigned to Cryptodesmidae Karsch, 1880 and Oniscodesmidae de Saussure, 1860. When I synonymised the two Tasmanian genera under *Asphalidesmus* (Mesibov 2002), I accepted Jeekel's family placement but pointed out that Haplodesmidae had become a temporary storage area for small polydesmidans with dense metatergal tuberculation and lateral expansion of the collum or the paranota of the second tergite.

Golovatch (2003) argued that the genitalia of *Asphalidesmus* were most like those of Southern Hemisphere Dalodesmidea. He noted that the lack of sphaerotrichomes in *Asphalidesmus* complicated its placement in Dalodesmidae, and that there were important differences in non-sexual characters between *Asphalidesmus* species and described forms in the other currently recognised dalodesmidean family, Vaalogonopodidae Verhoeff, 1940. He therefore informally referred *Asphalidesmus* to the suborder Dalodesmidea but said family placement would be premature (Golovatch 2003). In this paper I formalise Golovatch's suggestion by placing *Asphalidesmus* in Dalodesmidea (see above) without assigning it to a family.

There are now two Australian groups floating within Dalodesmidea: the *Noteremus-Paredrodesmus-Procophorella* group discussed above, and the *Asphalidesmus* group, which is likely to include *Agathodesmus steeli* Silvestri, 1910 from New South Wales. More needs to be learned about the large and still largely undescribed dalodesmidean fauna of Australia and of New Zealand (Johns 1970) before a satisfactory hypothesis of relationships within the suborder can be proposed.

***Asphalidesmus golovatchi* Mesibov, sp. n.**

urn:lsid:zoobank.org:act:D6CA5C87-8414-44C3-979A-080889549785

Figs. 1C, 1D, 2C, 6B, 6C, 7A, 7B, 8A, 8B, map Fig. 9.

Holotype. Male. Australia, Tasmania, Lake Osborne track, 43°13'04"S 146°46'03"E ±100 m, 880 m, 7 February 2004, K. Bonham, QVM 23:25723.

Paratypes. 2 females, 2 stadium VI females, Resurgence Cave, Vanishing Falls karst, 43°23'S 146°38'E ±1 km, 25 April 1992, S. Eberhard, QVM 23:12956; 2 males, 2 females, 1 stadium VI male, 2 stadium VI females, same details but 28 August 1992, S. Eberhard and V. Wong, QVM 23:12949; 3 males, 3 females, 2 stadium VI females (includes male+female in copula), Spring Cave, Vanishing Falls karst, 43°23'S 146°38'E ±1 km, 28 April 1992, S. Eberhard, QVM 23:12971; 1 male, Warra coupe WR001B, 43°05'48"S 146°41'55"E ±100 m, 90 m, pitfall 254 emptied 14 April 2000, R. Bashford, QVM 23:45660; 1 stadium VI female, Mystery Creek Cave track, 43°27'39"S 146°51'11"E ±100 m, 160 m, K. Bonham and R. and J. Francis, 25 February 2001, QVM 23:24747; 1 male, ca 100 m uphill from Mystery Creek cave, 43°27'42"S 146°50'57"E ±100 m, 5 February 2006, K. Bonham, QVM 23:46402.

Material examined. 4 females, 1 stadium VI female, Entrance Cave, Ida Bay karst, 43°28'S 146°51'E ±1 km, 20 January 1985, S. Eberhard, sample IB10-9; 'small sp. on mud, upper levels above final siphon', QVM 23:41576; 3 males, 3 females, 2 stadium VI males, Milk Run cave, Ida Bay karst, 43°29'S 146°51'E ±1 km, 22 August

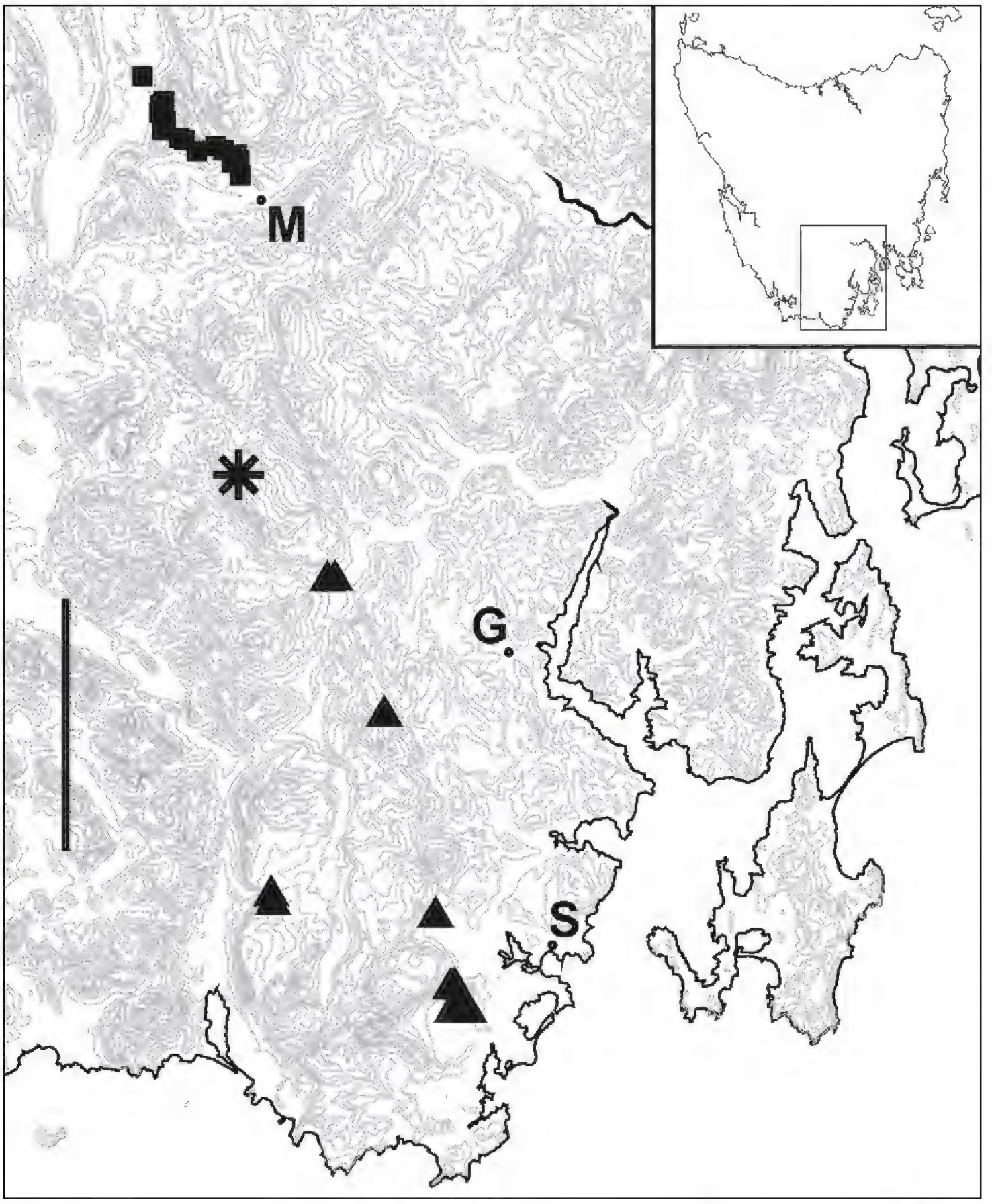

Figure 9. Localities as of 1 January 2009 for *Noteremus summus* sp. n. (✱), *N. infimus* sp. n. (■) and *Asphalidesmus golovatchi* sp. n. (▲). Scale bar = 25 km; grey lines are 100 m elevation contours. Town abbreviations: M = Maydena, G = Geeveston, S = Southport. Inset: map of Tasmania showing location of main map (rectangle).

1985, S. Eberhard, sample IB38-4, 'above stream at bottom - deep', QVM 23:12167; 2 females, 2 stadium VI females, 1 stadium V female, Spider Den cave (NL-3), North Lune karst, 43°24'S 146°50'E ±1 km, 5 February 1988, A. Clarke, QVM 23:11671; 1 stadium VI male, same details but 31 October 1988, sample 1088-15, QVM 23:46558; 1 stadium VI female, same details but sample 1088-23, 'under detritus at base of cave dark zone', QVM 23:46559; 1 stadium V female, Midnight Hole cave, Ida Bay karst, 43°28'S 146°51'E ±1 km, 2 April 1989, S. Eberhard, sample IB11-4, QVM 23: 12074; 2 females, Ida Bay cave 46, 43°29'S 146°52'E ±1 km, 23 March 1990, S. Eberhard, P1 chamber, QVM 23:46561; 1 stadium VI female, Huon River (Manuka Road), 43°05'46"S 146°42'28"E ±100 m, 100 m, 30 April 1997, R. Mesibov, plot 1M1, QVM 23:41564; 1 stadium VI female, same details but plot 1M2, QVM 23:46562.

Diagnosis. Differs from *A. leae* and *A. parvus* in having long, tapering rather than short, convex paranota, and in ozopore opening well away from base of paranotum (at about midheight on body in lateral view) rather than just above paranotal base.

Description. Juveniles and cave-dwelling adults unpigmented, but as in *Asphalidesmus leae* and *A. parvus*, tergites of surface-dwelling adults are partly encrusted with soil particles and stained light yellow-brown. Surface-dwelling males ca 7 mm long, maximum diameter 0.7 mm, maximum width across paranota 1.2 mm.

Male (Fig. 1C) with head and last ring strongly flexed to face substrate. Head sparsely setose, as wide as collum; antennal sockets strongly impressed ventrolaterally, separated by about 1.5X socket diameter. Antenna (Fig. 2C) short and thick; antennomere 6 widest and longest; relative antennomere lengths 6>>3>2>(4,5). Collum with anterior edge nearly straight, posterior edge broadly convex, corners blunt. Overall ring widths diminishing gradually from ring 3 posteriorly. Collum, metatergites and paranota with transverse zone of small tubercles (Figs 7A, 7B), each bearing a stout, pointed seta; metazonites also with much smaller, non-setiferous tubercles anteriorly and posteriorly; prozonites with narrow band of longitudinal ridges just anterior to suture, elsewhere uniformly covered with very small protuberances with blunt, rounded tips directed slightly posteriorly. Limbus composed of long tabs with multi-toothed tips and a narrow, outwardly curving medial section. Tergites of rings 2-16 with paired, paramedian, dorsal projections (Fig. 1D), each projection thick, rounded and directed slightly posteriorly; tergites of rings 17 and 18 each with one mid-dorsal, thick, rounded and posteriorly directed projection (dorsal projections absent in juveniles). Paranota of ring 2 greatly expanded laterally and anteriorly and strongly depressed, in lateral view masking head, antennae and collum. Paranota of rings 3-18 set low on body (Fig. 1D), more or less hastate, strongly depressed; lateral extent diminishing gradually from anterior to posterior; anterior and posterior margins scalloped with small, usually discrete, rounded tabs. Ring 3 paranotum slightly overlapping ring 2 paranotum. Pore formula 5, 7, 9, 10, 12, 13, 15-18; ozopore very small, opening in slight depression in low, cylindrical structure well above base of paranotum (Fig. 7B). Sternites somewhat longer than wide, longitudinal and transverse impressions well-defined. Pre-anal ring with a few

dorsal marginal setae, epiproct not developed, hypoproct paraboloid. Spinnerets in square array (Fig. 8B) in slight depression with low partition wall between dorsal and ventral pairs; sheath separated from seta by annular gap. Anterior legs (Fig. 2C) short; prefemur and femur a little expanded dorsally; relative podomere lengths tarsus>(prefemur, femur)>(postfemur, tibia). No sphaerotrichomes or brush setae; very small tuberculation of metazonite surface extending onto coxa/trochanter. Spiracles (Fig. 7B) opening on short, wide-rimmed elevations; on diplosegments with anterior spiracle above anterior leg and oriented anterolaterally, and posterior spiracle above and about midway between anterior and posterior legbases. Gonopore small, opening on distomedial projection of leg 2 coxa. Legpair 6, 7 bases well-separated to accommodate retracted gonopods, legpair 4, 5 bases a little less separated.

Gonopod aperture ovoid, about one-third prozonite width; posterolateral margins slightly raised. Gonocoxae small, truncated conical, weakly joined distomedially, with a few setae on basomedial and distolateral surfaces. Cannula prominent, inserting in shallow depression on basal surface. Telopodites separate, reaching to legpair 4 bases when retracted. Telopodite (Figs 6B, 6C, 8A) cylindrical, slightly tapering distally, with two slender branches arising at slight constriction at about three-quarters telopodite height; anteromedial branch bending laterally and terminating in 'fishtail' fork at about two-thirds height of posterolateral branch; posterolateral branch (= solenomere) curving posterolaterally, then slightly anteromedially before flattening and curling apically with two upright finger-like processes arising from curled, flat tip: a narrower, shorter, more lateral process, and a stouter, taller, more medial process bearing the end of the prostatic groove. Telopodite sparsely setose posterolaterally from near base to distal constriction. Prostatic groove running slightly anteriorly from insertion before running distally to telopodite constriction, then following curve of solenomere to tip.

Female as large as male; posterior margin of epigynum slightly raised medially; cyphopods not examined.

Distribution and habitat. Known from wet eucalypt forest and caves over ca 600 km^2 in far southern Tasmania from ca 100 m to 900 m (Fig. 9). Uncommon in forest. Sympatric over the whole of its range with *A. parvus*, which also occurs in caves.

Etymology. Adjective, genitive singular, for Sergei I. Golovatch, Russian diplodologist, who has generously given me advice on diplopodological problems and who has taken a particular interest in *Asphalidesmus*.

Remarks. Cave specimens of *A. golovatchi* are a little smaller than surface-dwelling specimens in the same stadium. In some of the mature cave specimens the paramedian dorsal projections are greatly reduced, although the median dorsal projections on the last two leg-bearing rings can be clearly seen.

The pair in copula from Spring Cave (QVM 23:12971) are in the usual position for mating Polydesmida. Although the male's head is flexed strongly down, there is still a gap between it and the female's head.

The spinnerets in *A. leae* are arranged as in *A. golovatchi*, while in *A. parvus* low partition walls divide the depression housing the spinnerets into four separate compartments (Figs 8B-8D).

Key to described species of *Asphalidesmus* Silvestri, 1910

1 Paranota longer (i.e., parallel to transverse axis of body) than wide (parallel to anterior-posterior axis); ozopore almost midlateral, well separated from base of paranotum; adults with middorsal projections on rings 17 and 18, some adults with paired paramedian dorsal projections on other rings; southern Tasmania only.....***Asphalidesmus golovatchi* sp. n.**

– Paranota about as long as wide; ozopore at base of paranotum; no dorsal projections on rings.....**2**

2 Paranotum with prominent rounded tab on posterior margin near base; gonopod telopodite with short anterior branch bearing end of prostatic groove, and long posterior branch ending in comb-like structure; southern Tasmania only .....***A. parvus* (Chamberlin, 1920)**

– Paranotum without prominent posterior tab; telopodite with anterior and posterior branches about equal in length and without comb-like structures, prostatic groove ending on posterior branch; northern Tasmania only ....***A. leae* Silvestri, 1910**

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